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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,192	11/25/2003	Srikanth Suryanarayanan	140312-1	9057

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
PATENT DOCKET RM. BLDG. K1-4A59
NISKAYUNA, NY 12309

EXAMINER	
CHENG, JACQUELINE	

ART UNIT	PAPER NUMBER
3768	

NOTIFICATION DATE	DELIVERY MODE
12/26/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/723,192	SURYANARAYANAN ET AL.	
	Examiner	Art Unit	
	JACQUELINE CHENG	3768	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114 was filed in this application after appeal to the Board of Patent Appeals and Interferences, but prior to a decision on the appeal. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on October 6, 2008 has been entered.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. **Claims 14-16** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. In addition to inquiry of whether a claimed method falls within judicial exception, Supreme Court precedent (Diamond v. Diehr, 450 U.S. 175, 184 (1981); Parker v. Flook, 437 U.S. 584, 588 n.9 (1978); Gottschalk v. Benson, 409 U.S. 63, 70 (1972); Cochrane v. Deener, 94 U.S. 780, 787-88 (1876)) and recent Federal Circuit decisions, require that a claim drawn to a process must be either (1) tied to another statutory class (such as a particular apparatus) or (2) transform underlying subject matter (such as an article or materials) to a different state or thing. If neither of

these requirements is met by the claim, the method is not a patent eligible process under 35 U.S.C. 101 and is improperly directed to nonstatutory subject matter. Thus, to qualify as a 35 U.S.C. 101 statutory process, the claim should positively recite the other statutory class (the thing or product) to which it is tied or positively recite the subject matter that is being transformed. In this case the claims are not tied to another statutory class such as a routine for acquiring an image data set using an imaging device, a routine for preprocessing using a processor.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims **1-6, 10-19, 23-31, and 35-39 are** rejected under 35 U.S.C. 103(a) as being unpatentable over Suri (US 6,842,638 B1) in view of Liang (US 5,570,404).

Claims 1-5, 11, 14-18, 24, 27-30, 36, and 39: Suri discloses an apparatus and method for producing an angiographic image representation of a subject. These systems can differentiate the vasculature form the non-vascular structures. An imaging scanner, such as a CT or an MRI, acquires imaging data from a portion of a subject including vascular contrast, such as a head/neck region. A reconstruction processor reconstructs an image from the data and then converts the image into an edge-enhanced image having enhanced vascular edges by applying mathematical transformation (col. 2 line 64-col. 3 line 8). A segmentation engine can then employ tracking systems which track a vessel starting from an initial seed location and quantify the vessel lumen (a geometric and a functional template) (col. 2 line 29-34). This segmentation engine also separates the vascular regions from the non-vascular regions. This is started by creating a preliminary bone mask to differentiate bone and vascular structures from the image data set by assigning a black pixel to the pixels that correspond to bone/air/vascular structures and assigning a gray pixel to pixels that correspond to tissue background. Although the preliminary bone mask has more than only bone and vascular structures, Suri discloses the invention as claimed, which is differentiating the bone and vascular structure (and air and muscle) from the tissue background (rest of the image data). The mask processor continues on from this intermediate mask, removing the more intense pixels, which corresponds to the vascular region, to generate a bone mask (col. 12 line 27-54). This mask is then

subtracted to generate the image of the vascular region of interest in either two dimensions or three dimensions (col. 8 line 22-38).

7. Suri discloses all of the claimed invention except for the bone mask being created for a plurality of sub-volumes based upon a spatial relationship between the bone and vascular structures. Liang discloses a method of separating certain objects from 3D-CT images (abstract). To do so Liang subdivides the images into slabs (sub-volumes) based upon the relationship between the object and the rest of the image. Each slab is processed differently depending on the intensity of the pixels of the top image in each slab. It would be obvious to use the sub-volumes of Liang in Suri to generate a preliminary bone mask based upon a spatial relationships between an object such as the bone and other parts of the image such as the vascular structure for the purpose of speeding up the processing time by processing sub-volumes of information instead of slice by slice.

8. **Claims 6, 19, and 31:** Suri discloses an edge volume processor that emphasizes the edges of the vasculature which in itself is determining a maximum gradient, which is the edge, for the area (col. 8 line 8-12).

9. **Claim 10:** Suri discloses differentiating the vasculature from background levels, which would include things like the table or support the patient is being imaged upon (col. 2 line 29-31).

10. **Claims 12, 25, and 37:** Suri discloses a dynamic constrained region growing process of identifying vessel centers, finding a first vessel direction , and then estimating vessel boundaries by iteratively propagating a closed geometric contour

arranged about the first vessel center. This is done for each vessel center and the estimated boundaries are interpolated to form a vascular tree (col. 3 line 27-40).

11. **Claims 13, 26 and 38:** Suri discloses smoothing the image which, after processed, will be an image of only the vascular structure (col. 14 line 30).

12. **Claims 7-9, 20-22, and 32-34** are rejected under 35 U.S.C. 103(a) as being unpatentable over Suri in view of Liang as applied to claims 1, 14 and 27 above, and further in view of VanMetter (US 6,351,571 B1).

Suri teaches using edge enhancement methods to help extract vascular structure in medical imaging. What Suri does not specifically teach is partitioning the image into sub-regions and implementing a fast algorithm in one sub-region and a slower, complex algorithm in another sub-region. These teachings are well known in the art as evident by VanMetter. VanMetter teaches using different algorithms for different regions to enhance edges. The first algorithm is a fast algorithm of just computing the convolution to obtain the low-frequency component of the image. The second algorithm, the masking convolution, is a complex one, especially when applied to real image (3D) space (col. 1 line 55-col. 2 line 44). It would be obvious to one with ordinary skill in the art at the time of the invention to combine VanMetter with Suri and Liang as Suri teaches using edge enhancements, for which one could use VanMetter's edge enhancement algorithms to execute the edge enhancement.

Response to Arguments

Applicant's arguments with respect to claims 1-39 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ohishi (US 7,432,924 B2) discloses another 3D imaging processing apparatus that has a bone mask.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JACQUELINE CHENG whose telephone number is (571)272-5596. The examiner can normally be reached on M-F 10:00-6:30.

15. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

16. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JC

/Long V Le/
Supervisory Patent Examiner, Art Unit 3768